CENTRAL INTELLIGENCE AGENCY

INFORMATION REPORT

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COUNTRY East Germany

SUBJECT Reflectometer Developed at VEB Werk fuer Fernmeldewesen HF, Berlin-Oberschoeneweide

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1. From late 1952 until early 1955, VEB Werk fuer Fernmeldewesen HF, Berlin-Oberschoeneweide worked on the development of a reflectometer with an antenna-protecting device. The instrument had not been completed as of Mid-May 1955. It was ready for use as a switchboard instrument in transmitters in early 1955, but further testing will have to be carried out before it can be used as a measuring device. 25X1 As of mid-May 1955, 30 reflectometers had been constructed for ultra-short-wave transmitters, and 20 had been built for television transmitters. 25X1

2. The reflectometer is a measuring device which operates on the directional coupler principle (Richtkoppler Prinzip). A small coupling loop passes through a slit into the hollow space of a coaxial conductor in such a way that the loop and the internal conductor are in the same plane. Outside of the external conductor, the coupling loop is provided on each side with wave impedances which amount to about 80 to 100 ohms each. Each end of the loop passes through a detector to an ammeter. The free terminals of the ammeter are grounded. The capacity and inductivity of the coupling loop are dependent on how far the loop goes into the hollow space. If capacity and inductivity of the coupling loop are the same, the following vectorial situation results: when a high-frequency current flows through the coaxial conductor in only one direction, its inductive component likewise has only one direction. The capacitative component has the same absolute value but is divided into two opposing directional components. Therefore, in half of the loop, the capacitative and inductive components cancel each other out, and in the other half they are added. As a result, no current flows through one ammeter while the other ammeter shows a definite reading. If, however, a part of the high-frequency current is reflected, as for example in the case of mis-matching of the circuit, a current reversal occurs and the inductive component, too, is divided into two directions. The instrument through which formerly no current was flowing then shows a reading which corresponds to the amount of the reversal, and the reading of the ammeter through which current was originally flowing decreases by a corresponding amount. 25X1

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If the direct current is equal to the reversed current, which occurs in the case of total reflection, both instruments show the same reading, which is one-half of the reading shown in the case of matching. Since the readings of the instruments are directly proportional to the current flowing through them, the relationship of the two readings indicates the "waviness" (Welligkeit) of the conductor. Inductivity and capacity of the coupling loop are closest to being equal when the depth of the loop amounts to one-third the radius of the coaxial conductor. Since, however, both values change more or less uniformly when the depth of the loop is changed, the sensitivity of the reading can be greatly varied by changing the depth of the loop. Since the part of the instrument which shows the reading contains no resonating circuits and since the inductivity of the coupling loop is small in comparison to the terminal resistances (abschliessende Widerstaende), the frequency range in which the instrument operates is very large. Good results were obtained in the vicinity of 200 mcs, and it is assumed that the ultimate frequency at which the instrument will operate effectively is even higher.

3. If a transmitter installation is operated with high current, a faulty antenna can ruin the transmitter. For this reason, an antenna protection device was built into the reflectometer which works in the following way: if the reversed current exceeds a certain fixed amount, a highly sensitive telegraph relay closes a 24-Volt direct-current circuit in which a strong-current relay is located. This relay then causes the anode voltage of the transmitter to be cut off. This device has proved most practical in ultra-short-wave and television transmitters with a current of up to 10 kW.

4. The depth of the loop can be regulated precisely up to 1/100 mm. by a micrometer screw device and can be set at any desired value. In using the reflectometer with the antenna protection device, it is necessary for a compensating resistance to be installed in the current reversal part of the instrument; the compensating resistance should correspond to the resistance of the winding of the telegraph relay. All conductors belonging to the part of the device which shows the reading have to be carefully shielded. The detectors must be a pair; that is, their internal resistances and transconductances have to be exactly the same.

5. Annexx No. 1 is a circuit diagram of the reflectometer with antenna protection device:

1	Coaxial conductor of up to 10 kW and 60 or 70 Ohms
1a	Internal conductor
1b	External conductor
2	Loop (width 1/10 mm.)
3	Detectors (Type ED 704)
4	Wave resistances (0.1 Watt, 80 Ohms)
5	Capacities (10,000 pF)
6	Coils (10 windings, 4 mm. diameter)
7	Ammeter (up to 2 milli-Amps)
8	Compensating resistance (2.5 KOhms)
9	Telegraph relay (Type Siemens-Halske, 0.25 milli-Amps)
10	Strong-current relay (24 V)
11	Power supply (220 V)
12	Blocking circuit

6. Annexxdix No. 2 is the construction diagram of the reflectometer with antenna protection device.

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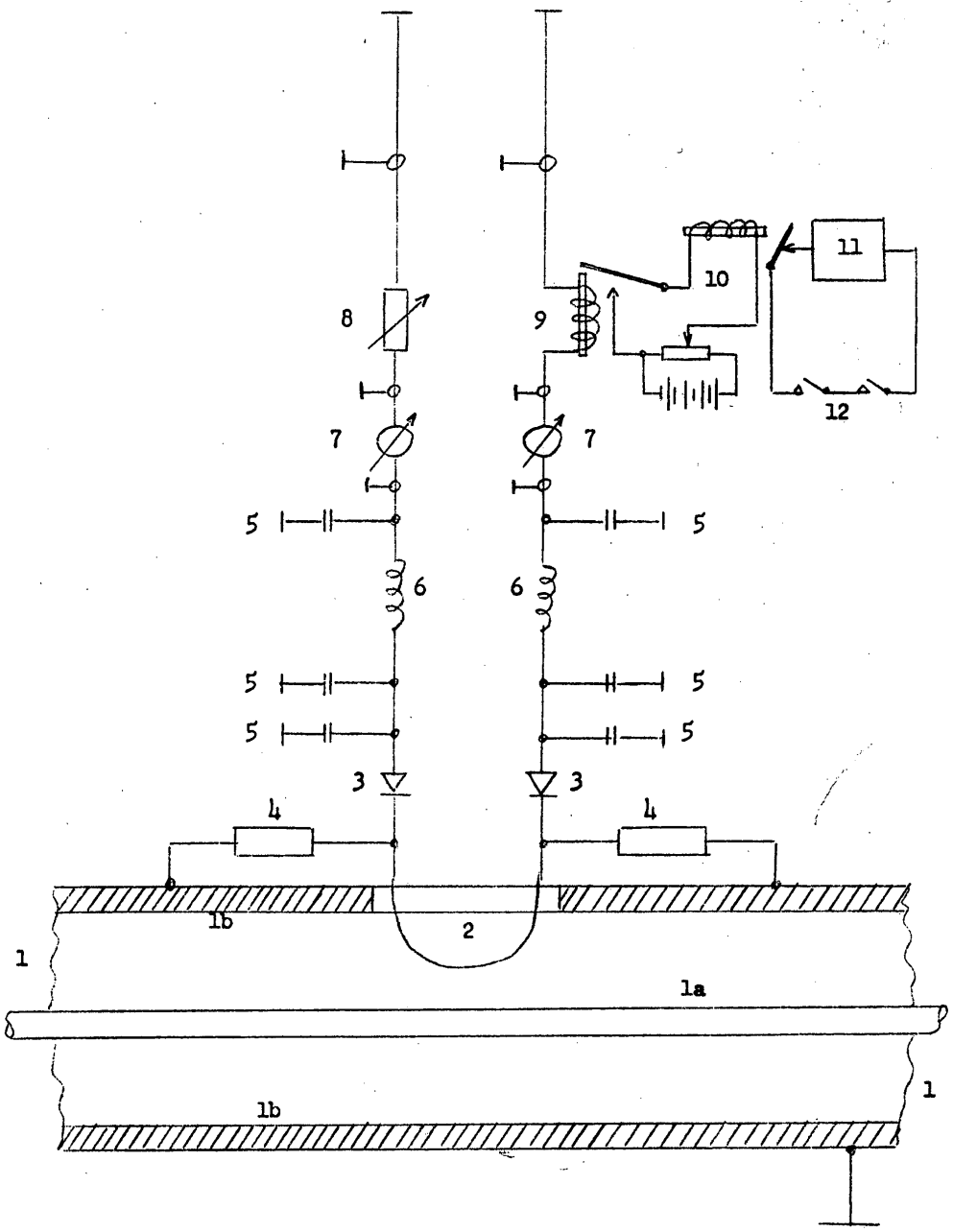
ANNEX 1



Reflectometer circuit diagram

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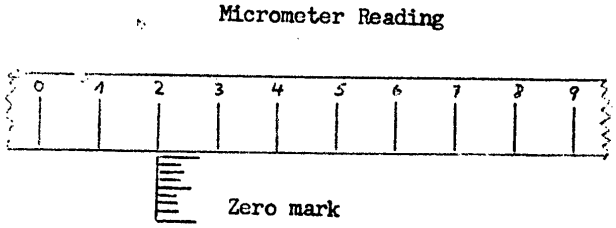

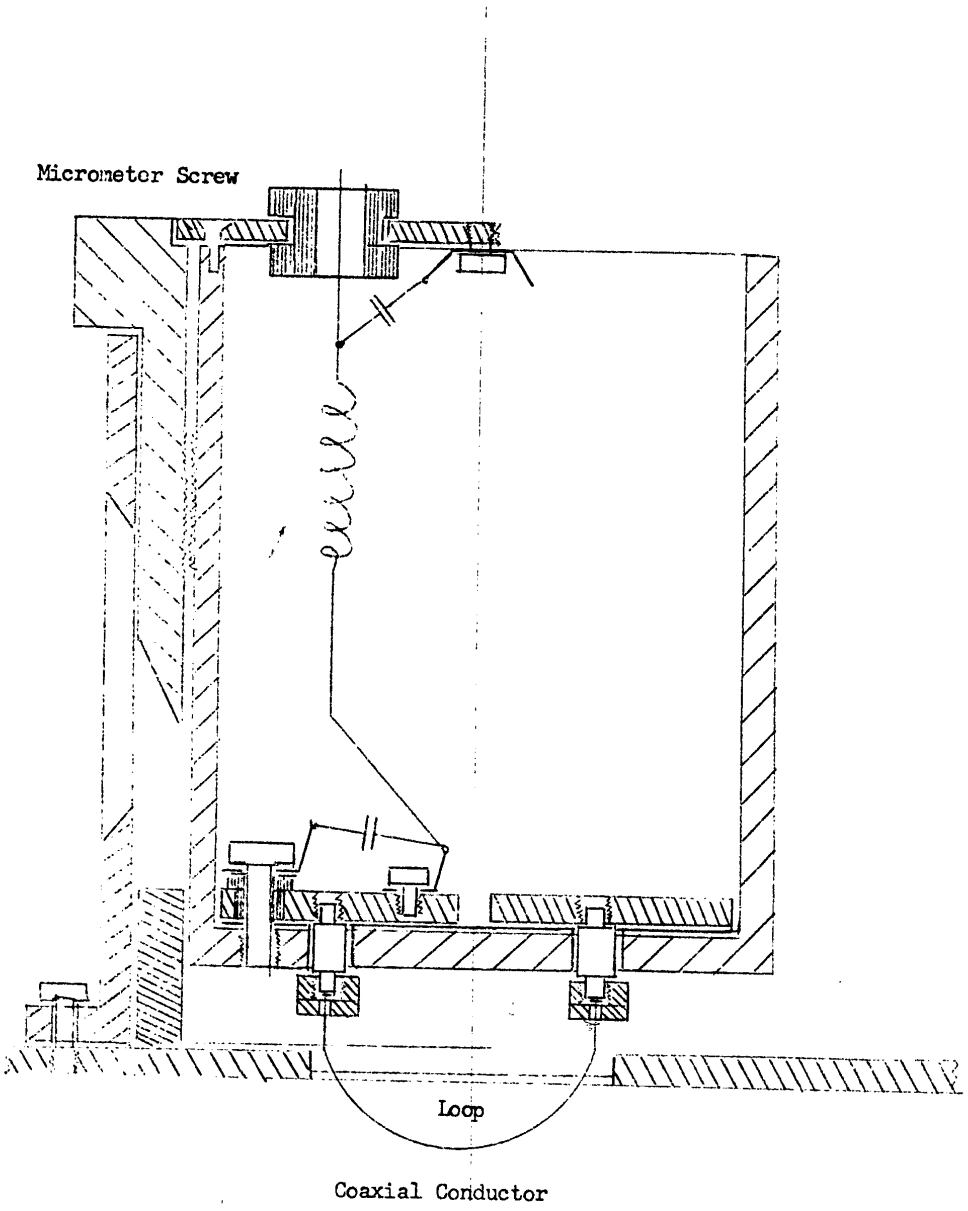

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Reflectometer construction diagram